

Application No.: 10/757,388

AMENDMENT TO CLAIMS

1. (Currently amended) A lead frame comprising:
a lead frame body comprising a sheet-shaped body made of metal;
a groove portion for forming a lead which is formed by a predetermined depth in a lead forming region on a surface of the lead frame body; and
a lead ~~formed so that the lead can protrude~~ having a portion which protrudes from the groove portion laterally onto the surface of the lead frame body, the lead being made of material different from material of the lead frame body.
2. (Original) A lead frame according to claim 1, the lead including: a first conductor layer formed in the groove portion; a second conductor layer formed on the first conductor layer; and a third conductor layer formed on the second conductor layer, wherein
the first conductor layer is assembled to an assembling member, and
the third conductor layer is assembled to a bonding pad of a semiconductor chip.
3. (Original) A lead frame according to claim 2, wherein the first conductor layer covers an entire inner wall of the groove portion.
4. (Withdrawn) A lead frame according to claim 2, wherein an interface of the first and the second conductor layer is located above the surface of the lead frame body.
5. (Currently amended) A lead frame according to claim ~~[[1]]~~ 2, wherein the lead includes a barrier layer for suppressing a reaction between the lead frame body and the first

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conductor layer, the barrier layer being provided between the first conductor layer and the groove portion.

6. (Withdrawn) A lead frame according to claim 2, wherein the first conductor layer is made of metal capable of forming an alloy together with solder.

7. (Withdrawn) A lead frame according to claim 2, wherein the film thickness of the first and the second conductor layer is 0.5 to 2 μm .

8. (Withdrawn) A lead frame according to claim 2, wherein the first conductor layer comprises a gold layer.

9. (Withdrawn) A lead frame according to claim 2, wherein the third conductor layer comprises a gold layer.

10. (Withdrawn) A lead frame according to claim 2, wherein the second conductor layer comprises a metallic layer, the primary component of which is nickel.

11. (Withdrawn) A method of manufacturing a lead frame comprising:

a step of forming a resist pattern on a surface of the lead frame body comprising a sheet-shaped body made of metal so that a lead forming region can be opened;

a step of forming a groove portion for forming a lead of a predetermined depth in the lead forming region when etching is conducted while the resist pattern is being used as a mask; and

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a step of forming a lead, the material of which is different from the material of the lead frame body, so that the lead can protrude from the groove portion onto a surface of the lead frame body.

12. (Withdrawn) A method of manufacturing a lead frame according to claim 11, wherein the step of forming the lead includes an electrolytic plating step of forming a metallic film on an inner wall of the groove portion while the resist pattern is being used as a mask.

13. (Withdrawn) A method of manufacturing a lead frame according to claim 11, further comprising a step of shrinking the resist pattern after the groove portion is formed while the resist pattern is being used as a mask so that a surface of the lead frame body round the groove portion can be somewhat exposed.

14. (Withdrawn) A method of manufacturing a lead frame according to claim 11, the step of forming the lead including:

a step of forming a first conductor layer in the groove portion and in its periphery exposed from the resist pattern which has shrunk in the shrinking step;

a step of forming a second conductor layer, which is laminated so that an end edge of the first conductor layer can be left, on the first conductor layer; and

a step of forming a third conductor layer on the second conductor layer.

15. (Withdrawn) A method of manufacturing a lead frame according to claim 14, the step of forming the second conductor layer including:

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a step of forming a thin conductive film on the first conductor layer; and
a step of conducting etch-back on the thin conductive film by means of anisotropic etching.

16. (Withdrawn) A method of manufacturing a lead frame according to claim 11, wherein the step of forming the lead includes a step of forming the first to the third conductor layer in the groove portion in order, and an interface of the first and the second conductor layer is located above the surface of the lead frame body.

17. (Withdrawn) A method of manufacturing a lead frame according to claim 11, wherein the step of forming the lead includes a step of forming a barrier layer for suppressing a reaction of the lead frame body and the first conductor layer, between the first conductor layer and the groove portion.

18. (Withdrawn) A method of manufacturing a lead frame according to claim 11, wherein the step of forming the groove portion includes an anisotropic etching step for forming a groove, the cross section of which is a rectangle of 0.5 to 2.5 μm depth.

19. (Currently amended) A semiconductor device comprising:
a semiconductor chip;
a multi-layer lead connected to the semiconductor chip and having a first conductor layer;
and

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a piece of sealing resin, wherein a portion of the reverse face of the lead protrudes from a principal plane of the piece of sealing resin, the first conductor layer covering an entire surface of said portion, and the lead is a thin film formed from the outer face side to the inner face side.

20. (Currently amended) A semiconductor device according to claim 19, the multi-layer lead further including: a first conductor layer; a second conductor layer laminated inside the first conductor layer; and a third conductor layer formed inside the second conductor layer, wherein an entire surface of the lead, which is exposed from the sealing resin, is covered with the first conductor layer.

21. (Withdrawn) A semiconductor device according to claim 20, wherein an interface of the first and the second conductor layer is located inside the surface of the sealing resin.

22. (Withdrawn) A semiconductor device according to claim 19, wherein the first conductor layer is made of metal capable of forming an alloy together with solder.

23. (Withdrawn) A semiconductor device according to claim 19, wherein the film thickness of the first and the second conductor layer is 0.5 to 2 μm .

24. (Withdrawn) A semiconductor device according to claim 20, wherein the first conductor layer comprises a gold layer.

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25. (Withdrawn) A semiconductor device according to claim 20, wherein the third conductor layer comprises a gold layer.

26. (Withdrawn) A semiconductor device according to claim 20, wherein the second conductor layer comprises a metallic layer, the primary component of which is nickel.

27. (Withdrawn) A method of manufacturing a semiconductor device, in which a lead frame is prepared, the lead frame including a lead frame body comprising a sheet-shaped body made of metal and also including a groove portion for forming a lead, the groove portion being formed in a lead forming region on a surface of the lead frame body by a predetermined depth, and also including a lead formed so that the lead can protrude from the groove portion onto a surface of the lead frame body, the lead being made of material different from the lead frame body, the method of manufacturing a semiconductor device comprising:

a semiconductor chip mounting step of mounting a semiconductor chip on a lead frame and electrically connecting the semiconductor chip to the lead;

a resin sealing step of covering the semiconductor chip with the sealing resin;

a step of removing the lead frame body by means of etching; and

a dicing step of dicing into individual semiconductor devices.

28. (Withdrawn) A method of manufacturing a semiconductor device according to claim 27, the lead including: a first conductor layer formed in the groove portion; a second conductor layer laminated on the first conductor layer; and a third conductor layer formed on the second conductor layer, wherein

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the first conductor layer is assembled to an assembling member, and

the third conductor layer is assembled to a bonding pad of the semiconductor chip.

29. (Withdrawn) A method of manufacturing a semiconductor device according to claim 28, wherein the first conductor layer is formed so that it covers an entire inner wall of the groove portion.

30. (Withdrawn) A method of manufacturing a semiconductor device according to claim 28, wherein an interface of the first and the second conductor layer is located above the surface of the lead frame body.

31. (Withdrawn) A method of manufacturing a semiconductor device according to claim 28, wherein the lead includes a barrier layer for suppressing a reaction between the lead frame body and the first conductor layer, the barrier layer being provided between the first conductor layer and the groove portion, the method of manufacturing a semiconductor device further comprising a step of removing the barrier layer by means of etching after the completion of resin sealing.